

6.2

Properties of Parallelograms

Goal Use properties of parallelograms.

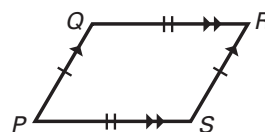
VOCABULARY

Parallelogram A parallelogram is a quadrilateral with both pairs of opposite sides parallel.

THEOREM 6.2

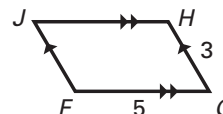
Words If a quadrilateral is a parallelogram, then its opposite sides are congruent.

Symbols In $\square PQRS$, $\overline{PQ} \cong \overline{SR}$ and $\overline{QR} \cong \overline{PS}$.



Example 1 Find Side Lengths of Parallelograms

$FGHJ$ is a parallelogram.
Find JH and FJ .



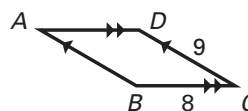
Solution

Opposite sides of a parallelogram are congruent.

$$JH = FG = \underline{5} \quad FJ = GH = \underline{3}$$

Checkpoint Complete the following exercise.

1. $ABCD$ is a parallelogram.
Find AB and AD .

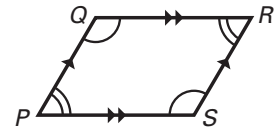


$$AB = 9, AD = 8$$

THEOREM 6.3

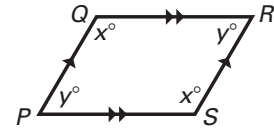
Words If a quadrilateral is a parallelogram, then its opposite angles are congruent.

Symbols In $\square PQRS$, $\angle P \cong \angle R$ and $\angle Q \cong \angle S$.

**THEOREM 6.4**

Words If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.

Symbols In $\square PQRS$, $x^\circ + y^\circ = 180^\circ$.

**Follow-Up**

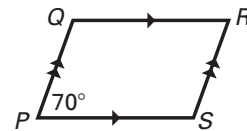
Use the words in the box at the right to make two true statements about parallelograms.

Opposite angles are congruent.
Consecutive angles are supplementary.

congruent
consecutive
opposite
supplementary

Example 2 Find Angle Measures of Parallelograms

$PQRS$ is a parallelogram.
Find the missing angle measures.

**Solution**

Opposite angles of a parallelogram are congruent.

$$m\angle R = m\angle P = 70^\circ$$

Consecutive angles of a parallelogram are supplementary.

$$m\angle Q + m\angle P = 180^\circ \quad \text{Write an equation.}$$

$$m\angle Q + 70^\circ = 180^\circ \quad \text{Substitute for } m\angle P.$$

$$m\angle Q = 110^\circ \quad \text{Solve for } m\angle Q.$$

Opposite angles of a parallelogram are congruent.

$$m\angle S = m\angle Q = 110^\circ$$

Answer $m\angle R = 70^\circ$, $m\angle Q = 110^\circ$, $m\angle S = 110^\circ$

Follow-Up

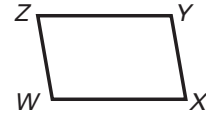
Estimate the angle measures in $\square WXYZ$.

$$m\angle W = \underline{100}^{\circ} \quad m\angle X = \underline{80}^{\circ}$$

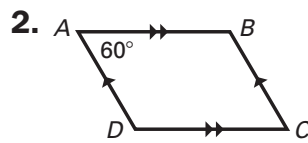
$$m\angle Y = \underline{100}^{\circ} \quad m\angle Z = \underline{80}^{\circ}$$

What is the sum of the angle measures?

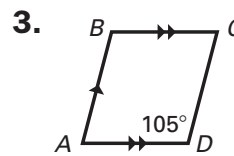
$$\underline{360}^{\circ}$$



✓ **Checkpoint** $ABCD$ is a parallelogram. Find the missing angle measures.



$$m\angle B = 120^{\circ}, m\angle C = 60^{\circ}, \\ m\angle D = 120^{\circ}$$

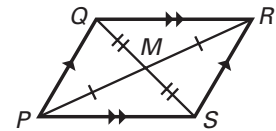


$$m\angle A = 75^{\circ}, m\angle B = 105^{\circ}, \\ m\angle C = 75^{\circ}$$

THEOREM 6.5

Words If a quadrilateral is a parallelogram, then its diagonals bisect each other.

Symbols In $\square PQRS$, $\overline{QM} \cong \overline{MS}$ and $\overline{PM} \cong \overline{MR}$.



Example 3 Find Segment Lengths

$TUVW$ is a parallelogram.
Find TX .

Solution

The diagonals of a parallelogram bisect each other.

$$TX = \underline{XV} = \underline{3}$$

